A STUDY TO DETERMINE IF IN-HOUSE TRAINING STAFF IN ORGANIZATIONS POSSESS THE KEY SKILLS NECESSARY TO AUTHOR WEB-BASED AND COMPUTER-BASED TRAINING PROGRAMS

by

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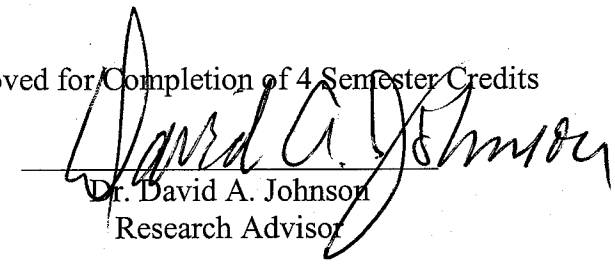
A Research Paper
Submitted in Partial Fulfillment of the
Requirements for the
Master of Science Degree
in

Training and Development

Approved for Completion of 4 Semester Credits



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ABSTRACT

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A STUDY TO DETERMINE IF IN-HOUSE TRAINING STAFF POSSESS THE KEY SKILLS NECESSARY TO AUTHOR COMPUTER-BASED TRAINING AND WEB-BASED TRAINING PROGRAMS

(Title)

Training and Development Dr. David A. Johnson August, 2004 70

(Graduate Program) (Research Advisor) (Month/Year) (# of Pages)

American Psychological Association (APA) Publication Manual, 5th edition

(Name of Style Manual Used in this Study)

This study examined in-house training staff who are members of web-based training (WBT) and computer-based training (CBT) design teams to determine if they have the skills necessary to author interactive multimedia programs. The four primary research objectives were to: (1) determine if training staff have the key skills needed to develop interactive multimedia programs; (2) identify the authoring skills staff feel they are lacking in; (3) identify the roles of design team members; and (4) describe the training methods needed to author effective training programs.

The researcher developed an online survey for individuals in several public and private organizations who design and develop CBTs/WBTs. The survey included

questions on demographics, design team size and roles, expertise and comfort levels in various skill areas, and training recommendations. Twelve key skills areas used in this study were taken from current research by Lewis and Whitlock (2003) based on a 1999 study conducted by Dr. Jan Seabrook of Arenicola Designs. The Arenicola study, published by the DfEE (Department for Education and Employment), identified 40 e-learning development skills.

Findings revealed that even in larger companies, the typical design team is three to five members, which results in almost all team members undertaking multiple roles in the authoring process. Also, expertise levels in the twelve skill areas and the overall comfort level with authoring multimedia programs increased for those who had more formal training in authoring skills and for those who had been designing and developing CBTs/WBTs for more than three years.

The findings indicate that employers need to be aware of the complex process of designing and developing interactive multimedia programs. They need to adequately prepare their design team members to author CBTs/WBTs by providing them with formal training, as well as hands-on, continuous practice, particularly on the more technical aspects of authoring programs.

ACKNOWLEDGMENTS

There are several people I would like to thank who have encouraged me over the last several years to obtain my Master's Degree. First, I would like to thank my former boss, Byron Malsin, at the University Of Wisconsin-Oshkosh for sparking my passion for training by hiring me in my first job as a trainer 7 ½ years ago. I would also like to thank him for supporting my decision to return school and his ongoing interest in what I was learning.

Next, I would like to thank the consultant I worked with during my employment at the State of Minnesota, Dr. Jeff Weinberg, for his excellence in teaching me Authorware and about the design process. His expertise helped me to overcome my fear of programming and prompted me to start a user group that proved to be an invaluable network of colleagues who were part of CBT/WBT design teams. I also want to thank my coworkers and friends from the State of Minnesota who believed in me and who supported my decision to leave my job to complete my thesis.

I would like to thank my husband Jim for also supporting my decision to leave my job early before the birth of our second child and for putting up with my complaints about trying to finish a thesis while taking care of an active 1 ½ year-old.

Finally, I would like to thank my advisor, Dr. David A. Johnson, for his recommendations, encouragement, and the words that stuck in my mind during what seemed like endless hours at the computer, "Now get that paper done".

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INTRODUCTION

Introduction to Authoring Interactive Multimedia Training Programs

There is much information available on the skills it takes for a trainer to develop and lead a traditional classroom session. However, with the increasing emphasis on using technology to facilitate learning, today's traditional classroom trainers need to use different skills in order to incorporate this technology into their training programs. More and more organizations are putting an emphasis on e-learning, or interactive multimedia training programs, to deliver training to their customers. Interactive multimedia training programs include computer-based training CBT) and web-based training (WBT), which are delivered either via the Internet, a company's Intranet, or CD-ROM. Universities, corporations, and government organizations all have developed their own computer-delivered courses as an alternative to classroom training (Clark, 2003). In a study done at Boise State University, Kaupins (2002), states that 70% of four-year colleges offer web courses. Furthermore, in companies with 100 or more employees, 74% use the Internet and 87% use CD-ROMs in training.

According to Hall (1997), interactive multimedia programs allow the user to manipulate graphics in real-time. They are normally "authored with a software tool that allows for the necessary programming to add multimedia and to manage high levels of interactivity and record keeping" (p.9). Examples of multimedia that can be added include video, sound, graphics, and animation. All of these elements encourage trainees to use more of their senses, resulting in an enhanced learning environment.

What this means is that trainers need to learn and/or use different skills if they are expected to develop interactive multimedia training programs in their organizations. Many organizations choose to contract out the task of developing web/computer-based training (W/CBT); however, many are choosing to have their own in-house training staff develop these training programs. Are these individuals equipped with the skills they need to develop web/computer-based training? Some trainers may already possess these skills; some may need to acquire them. For those that need to acquire them, there can be a long learning curve, depending on several factors, such as the trainer's skills, training and experience, other job responsibilities, and the authoring tool that the organization chooses to use to develop their programs. In addition, some staff may be resistant to learning how to develop web/computer-based training. One reason trainers may be resistant to learning how to develop multimedia programs is fear. Many trainers feel that e-learning will take over their job, thus they will lose their prestige or even their jobs (Rosenberg, 2001). Are organizations adequately preparing their trainers to learn the skills necessary to develop an effective web/computer-based training course? What skills do they need, and how are these skills different from those needed to develop traditional classroom training? What makes an effective web/computer-based training program?

Michael Allen, founder and former chairman of Macromedia, Inc. (2003), states that excellent design is not an easy task – good e-learning design uses available technologies effectively in order to make learning happen. This study will not only focus on the design and development of web/computer-based training programs, but it will also focus on the skills needed to design and develop an interactive program for more effective learning. For the purposes of this study, we will use the term "authoring", and

will adapt the definition used by a study conducted in the UK in 1999 by Dr. Jan Seabrook of Arenicola Designs entitled "Authoring for CBT and Interactive Multimedia". Authoring includes "the whole process of producing an interactive training package – including project management, instructional design, analysis, development, and production" (Whitlock, 1999, p.14).

Statement of the Problem

Do in-house training staff who are members of web/computer-based training design teams possess the key skills necessary to author effective interactive multimedia programs?

Research Objectives

The objectives of this study are to:

1. Determine if training staff have the key skills needed to develop interactive multimedia programs
2. Identify the authoring skills staff feel they are lacking in
3. Identify the roles of design team members
4. Describe the training methods needed to author effective training programs.

Purpose of the Study

The purpose of this study is to determine if in-house training teams in organizations possess the skills necessary to develop interactive multimedia training programs. Many developers of traditional classroom training have never developed these types of courses, but are now required to do so by their organizations because of the increasing emphasis on using technology to enhance training in the workplace. Many organizations choose to develop their programs in-house; others choose to outsource.

This study will focus on organizations that choose to develop interactive multimedia programs in-house with existing staff. Not only will the study identify the key skills that these individuals need to author web/computer-based training programs, but it will also assess their competency for each skill. Identification of staff competency for each of these key skills will help employers and educators decide how to train authoring skills to their employees and students. It will also assist employers in determining how much time it will take to learn the skills necessary to develop an interactive program.

Limitations of the Study

There are two limitations to this study.

1. Due to the fact that many companies only have a few people (or in many cases, only one person) authoring their interactive multimedia programs, it is difficult to get a large study population without contacting many organizations. Many of the organizations that were contacted to participate in this study only had one to five individuals on their web/computer-based training design teams.
2. The study examines twelve key skills as identified by Lewis and Whitlock (2003). These twelve skill areas were based on 40 e-learning development skills examined in a 1999 study by Dr. Jan Seabrook of Arenicola Designs. The Arenicola study, published by the DfEE (Department for Education and Employment) in the UK, is only one study that directly measures the skills of individuals authoring web/computer-based training courses. The current study does not examine additional skills that may be

needed beyond the twelve key skills identified by Lewis and Whitlock or the 40 development skills listed in the Arenicola study.

Definitions of Terms

Asynchronous Learning – events that take place independently in time, at the learners' and instructor's convenience (Driscoll, 1998).

Authoring – "the whole process of producing an interactive training package – including project management, instructional design, analysis, development, and production" (Whitlock, 1999, p. 14).

Authoring Systems - a category of academic software that allows the developer to create custom computer-enhanced lessons (Lever-Duffy, McDonald, and Mizell, 2003).

Computer-based Training (CBT) – a type of education in which the user learns by executing training programs on a computer (http://www.pcwebopedia.com/TERM/C/CBT.html).

CD-ROM – Compact Disc – Read Only Memory (Harrison, 1999).

DfEE Study – A 1999 study conducted by Dr.Jan Seabrook of Arenicola Designs entitled "Authoring for CBT and Interactive Multimedia" that was published by the Department for Education and Employment in the United Kingdom.

e-learning –"any form of learning that utilizes a network for delivery, interaction, or facilitation" (Weippl, 2002, p. 1).

HTML – Hyper Text Markup Language – the computer language that has been agreed upon for use on the Internet's World Wide Web (Lever-Duffy et al., 2003).

Hypermedia software – an adaptation of multimedia that organizes information so the user can make "hyperjumps" from and to different components of the instructional content (Lever-Duffy et al., 2003).

IBT – Intranet- or Internet-delivered training (Harrison, 1999).

Instructional Interactivity – "Interaction that actively stimulates the learner's mind to do those things that improve ability and readiness to perform effectively" (Allen, 2003, p. 255).

Interactive Multimedia – "the integration of text, audio, graphics, still image and moving pictures into a single computer-controlled, multimedia product" – also referred to as Hypermedia (http://www.ericfacility.net/ericdigests/ed340388.html).

Interactivity – "a dialog between the learner and the e-learning application" (Allen, 2003, p. 22).

Multimedia – The use of more than one medium that is delivered on the same computer screen such as video, graphics, text, audio (Harrison, 1999).

Multimedia software – authoring systems that offer more advanced and complex multimedia learning tools (Lever-Duffy et al., 2003).

Self-directed Learning – "individualized instruction available to those who need it on demand. It is designed from the point of view of the learner rather than the trainer, available in short, self-instructional modules which can be studied by individuals at their own pace, place, and time, structured to give the learner control over his or her learning. (Harrison, 1999, p. 20)

Synchronous Learning – events that take place in real-time, when learners and instructors are on-line at the same time having direct contact (Driscoll, 1998).

Web Authoring Software – an authoring tool designed to create multimedia products specifically for use on the Internet (Lever-Duffy et al., 2003).

Web-based training (WBT) – any learning or training delivered over a Web – either the internet or an intranet within an organization (Harrison, 1999).

Web/Computer-Based Training (W/CBT) – "a web-based, multimedia method that features drill and practice, simulations, reading, and question and answer" (Driscoll, 1998, p. 275).

CHAPTER II:

LITERATURE REVIEW

Introduction

It is well known that technology is playing an increasingly important role in the field of training. According to Microsoft Chairman Bill Gates, the use of online training increased five times faster than classroom training in 1999 (Rosenberg, 2001). This may be due to the fact that the use of technology such as e-learning provides many benefits to organizations. Allen (2003) lists the following eight advantages of well-designed e-learning:

- Improved customer service
- New processes get up and running faster
- Reduction in employee turnover
- Improved morale
- Increased production
- Decreased errors
- Improved product quality
- Improved efficiency.

Even though there are many benefits to e-learning, and there is a growing emphasis on technology, most training departments still concentrate their resources in the area of traditional classroom instruction (Rosenberg, 2001). Yet the impact of traditional classroom training will most likely decrease in the future due to changes in society, business, and technology. What this means is that trainers need to change their perceptions of learning. These perspectives can be broadened with e-learning.

Characteristics of Web/Computer-based Training

E-learning encompasses many applications and processes such as web-based learning, computer-based learning, virtual classrooms, and digital collaboration (Allen, 2003). Content may be delivered via the Internet, an intranet/extranet, audiotape, videotape, satellite broadcast, interactive TV and CD-ROM (Weippl, 2002; Allen, 2003). This study examines two forms of e-learning, web-based and computer-based training programs, which are delivered over the Internet, an internet/extranet, or via CD-ROM. These programs will also be referred to as interactive multimedia programs throughout this paper.

In Web/Computer-Based Training (W/CBT), learners engage in programs that use multimedia (Driscoll, 1998). These programs involve interactions that are controlled by the learner or the program, based on responses. There are several characteristics of W/CBT programs. First, they are self-paced – learners do the program at a convenient time for them and they set their own pace for completing modules. There is individual learning, meaning that learners work alone to master skills. Furthermore, the programs are highly structured – developers can predict the answers and provide feedback, reinforcement, and remediation. Finally, web/computer-based training programs have discrete units of instruction, meaning that the content is divided into lessons and modules. This division makes it easier to teach measurable objectives.

Education versus Training

When developing web-based or computer-based training programs, it is important for trainers to know the differences between education and training. Harrison (1999) states that education is about knowledge, and training is about improving performance.

This difference between education and training is important to know in order to design effective learning materials. Most senior managers use the educational view of training, where the main focus is on telling a group how to do something rather than on improving performance and learning. In the educational view of training, trainees attend courses given by a subject matter expert in a formal classroom setting. The trainees are passive during these sessions. In education, the power belongs to the teacher. Training is different from education in that it is "about the application of skills and knowledge to raise performance" (Harrison, 1999, p. 21). The two essential training elements are people and performance. Trainers often fall into the trap of the educational style of training. Poor training is often due to a focus on the trainer's needs instead of the learner's needs.

Having distinguished between "education" and "training," it is important to know how self-directed learning fits into the development of interactive multimedia programs. In self-directed learning, the focus of power is shifted from the trainer to the learner. (Harrison, 1999). The trainer's role is to "design effective learning materials that the learner can use to improve his or her performance" (p. 22). Harrison states the following about self-directed learning:

> Self–directed learning is individualized instruction available to those who need it on demand. It is designed from the point of view of the learner rather than the trainer, available in short, self-instructional modules which can be studied by individuals at their own pace, place, and time, structured to give the learner control over his or her learning. (p. 20)

Self directed learning can include a mix of the following media – books, computer-based training, multimedia CD-ROM, intranet- or internet-based delivery, workbooks, video, audio, etc. It is important for trainers to understand the principles of self-directed learning in order to develop effective training programs, whether it is in a traditional classroom setting or via multimedia programs.

Traditional Trainer Roles and Skills

What exactly are the roles of the traditional classroom trainer, and what skills do they need? In traditional classroom training, the main role of a trainer is to facilitate learning (Goad, 1997). To be an effective facilitator of learning in the workplace both today and in the future, traditional classroom trainers must possess the following six skills:

- managerial ability
- interpersonal communication skills
- problem solving and decision making skills
- creativity and innovation
- information literacy
- computer literacy.

According to Goad (1997) managerial ability involves managing time, resources, funds and staff members. Interpersonal communication skills include the ability to read and comprehend, write, speak, listen and use nonverbal skills. Trainers need the ability to motivate learners, including using electronic methods to do so. Problem solving and decision making skills are important because managers are continually pushing the problem-solving process down to the lowest levels in organizations. Creativity and

innovation involves "the ability to generate fresh ideas and new ways of doing things" (Goad, 1997, p.10). Trainers also need to have information literacy, which is the ability to find, access, evaluate and use information from a variety of sources to solve problems. This skill is important because today's workplace is knowledge-driven. Lastly, computer literacy is an important skill because, as discussed earlier, more and more training is being delivered via the computer. Goad (1997) defines computer literacy as "the ability to obtain information from a variety of sources" (p. 10). This includes knowing the basics of an operating system; proficiency in word processing, other applications such as spreadsheets, database management packages, or a company's customized software; and experience in using electronic mail, the Internet, intranets.

The computer literacy skills identified by Goad (1997) are especially important for trainers who develop CBTs or WBTs. With the increasing emphasis on the use of technology in training, skills to author CBTs/WBTs may be necessary for trainers to learn if an organization chooses to develop their interactive multimedia training programs in-house. However, technical skills are just one piece of the design process. Because roles change when developing e-learning, trainers who author multimedia programs need additional skills to effectively design and develop interactive training programs. These skills are identified in this chapter.

Authoring Skills

In e-learning, the traditional trainer role becomes an "author" – this role is also referred to as the "designer" or "developer" of the program (Lewis and Whitlock, 2003). A key difference between e-learning and classroom training is that when the learner is interacting with a web or computer-based training program, the author is not present to

deal with any problems or questions the learner has. Unlike the classroom trainer, the author of an e-learning program must transfer all of his or her knowledge onto paper or a screen before he or she can start developing a program. Because authors may not be familiar with the subject matter like a classroom trainer, they may need the help of a subject matter expert.

It is not guaranteed that a good classroom trainer will make a good author, as the skill set is different. In addition to the skills identified by Goad, classroom trainers should possess the following seven skills and characteristics: they think on their feet, talk fluently, are subject-oriented, present topics orally, give a solo performance, manage classes and groups, and memorize the learning content (Lewis and Whitlock, 2003). Authors, on the other hand, plan intensively, write fluently, may not necessarily be subject experts, rarely meet learners and thus have less need for well-developed interpersonal skills, tend to be team members, anticipate the needs and difficulties of individual learners, and think logically.

As organizations change, there is increasing pressure on staff to learn more about technology, such as HTML, XML, Java or an authoring tool (Rosenberg, 2001). In his research, Rosenberg found that the five most important skills for developing e-learning programs are: instructional design, evaluation, information design, performance consulting, and human factors. These skills are more important in developing successful e-learning than web programming, HTML, and authoring.

How do training staff acquire the necessary skills to develop an effective web/computer-based training program? Organizations must be willing to train the current workforce in order to gain these skills. Employees not only need to attend

training sessions, but they also need to get experience in developing a training program. People need to become comfortable with the new process, and this takes time. Furthermore, the interest and skills of the individual should be matched to an appropriate task or role in the development process. Once staff feels comfortable with their new e-learning skills, the organization should provide continuous learning so that they keep up with what is happening in the technical field.

In a study that was done on introducing multimedia to medical students in a community-based teaching hospital, the researchers discovered that the design team needed to enroll in formal classes on development tools (Koller, Frankenfield, and Sarly, 2000). When they attempted to learn the development tools by "playing" and not attending any formal training, the developers found that the learning process was extremely slow and painful. The recommendation by the researchers of this study to organizations was to get the design team properly trained on development tools through formal instruction.

The Importance of Good Design and Interaction

Not only do developers of web/computer-based training need the skills to develop a training course, they need the skills to develop an effective training course. As stated earlier, good e-learning design is essential to the success of a web/computer-based training program. This is important whether the program is developed for business and industry or for education. Many educators in this day and age are not trained to properly integrate technology into the classroom (Rogers, 2002). For example, many universities do very little to help professors progress in the area of integrating technology in the

classroom. Therefore, many classroom teachers struggle to keep up with changes in technology.

Interaction is an important element of a good program design. According to Rogers (2002), "Interaction is considered key to effective learning, positive learner attitudes, and the success of distance education" (pp. 106-107). Often, little attention is given to the level of interaction among the participants. Berg (2003) states that "interactivity is a key issue in the designing of educational software" (p. 70). Some computer-based training is simply a slide show, meaning that the only interactivity involves the user clicking on an arrow to move to the next slide. Driscoll (1998) calls these types of programs "electronic page turners" that resemble books, meaning the information is presented in a linear format one page at a time. Likewise, Allen (2003) states that these programs turn into ineffective electronic page turning if interactivity is not created in them. Other computer-based training programs have a lot of interaction, meaning the user has control through simulations, communication with other users and the instructor, and even simple computer programming (Berg, 2003).

According to Rosenberg (2001), simulations are important in CBT or online learning because they increase the realness of the program. Learners are able to test their knowledge and skills, thus making the program motivating while allowing for the transfer of new skills. Hall (1997) explains that Interactive Web-Based Training Programs are useful for developing simulations since they allow the user to manipulate graphic objects in real-time. Simulations are therefore realistic. These types of programs are delivered via CD-ROM or the Internet. They are usually authored with a full-scale software tool that includes the programming capabilities to add multimedia and manage high levels of

interactivity and record keeping. Full-scale authoring tools also have plug-ins for delivery over the Internet. Two examples of this type of authoring tool are Authorware and Toolbook II.

Allen (2003) takes the concept of interactivity even further when he introduces the term "instructional interactivity". Just because a multimedia program includes interaction, it doesn't mean that it is good interaction. Even if a program has buttons, graphics, and animation, it does not necessarily mean that it has interactivity. Instructional interactivity includes the effective use of four essential components: context, challenge (stimulus), activity, and feedback. Good interactions are purposeful to the learner, allow the learner to apply authentic skills and knowledge, and include intrinsic feedback.

To summarize, Driscoll (1998) lists the eight essential attributes of a well-designed WBT: interactive, nonlinear, easy-to–use graphic interface, structured lessons, effective use of multimedia, attention to educational details, attention to technical details, and learner control. These characteristics are necessary for developers to apply in order to create effective training programs.

Instructional Design Models

Just as there are models such as ADDIE for designing traditional classroom training sessions, there are also models for designing web/computer-based training programs. The phases in these models are very similar. The ADDIE model includes five phases: Analysis, Design, Development, Implementation, and Evaluation (Allen, 2003). This type of model is also referred to as instructional systems design (ISD). Harrison (1999) utilizes a six-phase systematic approach in the design of web-based training and

computer-based training. This model includes one additional phase to the ADDIE model. The six phases are: Analysis, Design, Development, Testing and Improvement, Implementation, and Evaluation. In the Analysis phase, the training need (performance problem) is identified as well as the needs of the target group. The final objective for learning is defined here. In the Design phase, the topic is broken down into chunks, then grouped into modules that can be taught together. The appropriate media and methods are chosen at this point, and appropriate tests and learning activities are designed for each module. In the Development phase, the draft material is produced. The draft is tested by representatives of the target group in the Testing and Improvement Phase. The program is then edited and improved based on the results of the test group. In Implementation, the material is used by the target audience in the real environment. Finally, in the Evaluation phase, the solution to the original performance problem is checked.

Driscoll (1998) also supports a similar Instructional Systems Design (ISD) model for developing web-based instruction. According to her, there are only three phases to a web-based training project: Design, Development, and Delivery. The Design phase includes needs analysis, synthesis, design, blueprints, and evaluation. The Development phase includes multimedia development, code, and prototype. The Delivery phase includes implementation, evaluation, and maintenance. She states that developers need to take a systemic view as well as a systematic view when developing web-based training. A systemic view involves understanding all of the technical infrastructure issues of the organization.

Driscoll (1998) further explains the Design phase by showing web-based training design as a looping process that requires the designer to revisit each step whenever there

are changes that may affect the project. The first stage of the Design phase is Assessing Learner Needs – in this stage the goal, target audience, and delivery environment are identified. In the second stage, Selecting the Most Appropriate Method, the designer selects the type of web-based training to be used. The four types are Web/Computer-based Training, Web/Electronic Performance Support Systems, Web/Virtual Asynchronous Classroom, and Web/Virtual Synchronous Classroom. The next stage, Designing Lessons, is where a general plan is formulated to create interactions, plan feedback loops, and structure and sequence resources. Based on this plan, blueprints are developed to document the interactions, feedback loops, and information structures in the fourth stage, Creating Blueprints. Finally, the WBT materials are tested for accuracy, effectiveness, and clarity in the Evaluating Programs phase.

Allen (2003) also supports a similar design process to Driscoll which he says takes on an iterative approach rather than a waterfall approach, as is typical in ISD models. He calls this model Successive Approximations, which incorporates ISD and ADDIE activities, but also allows backing up to previous steps in the design process.

Authoring Systems/Tools

In order to develop CBTs or WBTs, developers need to use an authoring system. According to Lever-Duffy, McDonald, and Mizell (2003), authoring systems are a category of academic software that allows the developer to create custom computer-enhanced lessons. Authoring systems vary in interface format, capabilities, and hardware requirements. There are two types of authoring systems – hypermedia software and web authoring software. Hypermedia software is an adaptation of multimedia that not only uses multiple media, but also organizes information so the user can make “hyperjumps”

from and to different components of the instructional content. Multimedia software includes authoring systems that offer more advanced and complex multimedia learning tools. Although these tools offer more power and function, they can be more expensive to use and more complex to learn. They also may require higher-end hardware than may be found in the typical classroom. Some examples of this hypermedia and multimedia software include Macromedia Director, Asymetrix Toolbook, Apple Hypercard, and Hyperstudio.

Web Authoring Software is a type of authoring tool designed to create multimedia products specifically for use on the Internet (Lever-Duffy et al., 2003). This type of software shares many of the tools and features of hypermedia software. The difference with this type of software is that it generates hypermedia that is saved in a Hyper Text Markup Language (HTML). HTML is the computer language that has been agreed upon for use on the Internet's World Wide Web. Internet browsers are used to view and navigate these types of hypermedia pages. Some examples of Web Authoring Systems include Microsoft Front Page, Adobe GoLive!, and Macromedia Web Design Studio.

Currently, there are several online training systems on the market. According to Hall (1997), the "Big Four" authoring tools for training are: Authorware, Quest, IconAuthor, and Toolbook II. Authorware (produced by Macromedia) is one of the leading tools for creating interactive training programs. Director is another tool that is produced by Macromedia. Director is better used by integrating its movies into training programs such as Authorware, rather than as a primary authoring tool. ToolBook II, produced by Asymetrix, is another authoring tool. Because it is both an authoring environment and a training environment, it provides a means to manage and track

students. IconAuthor, a registered trademark of Aimtech Corporation, allows developers to create interactive multimedia applications for delivery on the Internet. Quest, produced by Allen Communications, is another tool used for developing interactive training – it has strong computer-managed instruction (CMI) capabilities for data tracking. Another tool, IBTAuthor, is a smaller program that is designed specifically for training over the Internet or a company intranet. Hall also mentions that there are other authoring systems that are simpler to use. Examples of these are HTML editors or Web page layout programs, such as Microsoft's FrontPage and Macromedia's Dreamweaver.

Design Team Roles

Rosenberg (2001) states that a bigger issue is who should author CBT and WBT programs rather than what authoring tool to use. There are several things that must be kept in mind when thinking about who will author a program. First of all, it takes experience, mentoring and much training in instructional design to create high quality online training. Second, the design team should be careful in using Subject Matter Experts (SMEs) as authors. An SME may not automatically have adequate instructional design experience or be motivated to develop learning materials. The SME should work with an instructional designer in a team approach. Third, no authoring tool can do everything – multiple tools will most likely be needed when developing a program. Fourth, standardizing based on one tool may restrict functionality, flexibility, and innovation. Fifth, templates may help make authoring easier for less experienced individuals; however, using templates can limit the sophistication of the program. Sixth, many times authors need to use other tools such as programming in C++, HTML, XML or Java in order to develop more complex interactions and to run the program on the web.

Finally, authoring is just one aspect of e-learning. The program also needs to be tested, debugged, maintained, and upgraded, all of which may require specialized software.

According to the 1999 Arenicola Designs study that was published by the DfEE, there are six roles that e-learning developers undertake (Lewis and Whitlock, 2003). These roles are: Project Leader, Instructional Designer, Courseware Designer, Programmer, Graphics Designer, and Audio-visual Coordinator. In a small team, these roles may overlap. Often, the roles of the instructional designer and the courseware designer are combined. Furthermore, the titles may vary – instructional designer may also be known as curriculum designer and the courseware designer may also be called the author. Team size may vary from one to eight people, depending on the size of the organization. In-house teams tend to be smaller and tend to contract out functions such as the Audio-visual Coordinator role.

Driscoll (1998) also has recommendations for establishing a web-based training team. She states that developing web-based training requires many team members with specialized skills. The roles of the team are: Project Manager, Instructional Designer, Systems Manager, Subject-Matter Experts(s), Learners' Manager(s), Legal Counsel, Editor(s), Programmer(s), Graphic Artist(s), Webmaster, and Instructor(s). These roles apply to all four types of web-based training, not just Web/Computer based Training, which is the type of multimedia training being addressed in this study. Hall (1997) identifies similar roles – a project manager, instructional designer, programmer or author, graphic artist, subject matter expert, Webmaster, and someone who can obtain funding for WBT from management. Hall also states that these roles may vary by size of an

organization; i.e., only large teams may have all these jobs. In smaller organizations or jobs, one person may perform several of these functions.

Harrison (1999) also identifies different roles that are involved when using the systematic approach. A normal split for a project team would be: project manager/analyst; designers; and developers (programmers, desktop publishers, video specialists, etc.). Organizations may do this split differently – many times the same person performs all these roles. In larger organizations, the roles may also be split. It is up to the organization to determine who takes on what role(s) on the design team and how those individuals will be trained the skills necessary for those roles. Finally, Allen (2003) suggests that the following individuals also be included at various points in the design process: executives, performance supervisors, subject matter experts, experienced teachers, recent learners, and untrained performers.

Design Team Skills

Allen (2003) states that "a lot of knowledge and information must guide design and development" (p. 43). Because the design and development of good e-learning is a complex undertaking, content knowledge and expertise are required in a wide range of areas. These areas include text composition, illustration, testing, instruction, interactivity design, user interface design, authoring or programming, and graphic design. However, it is hard to find a single person with all these skills; therefore, forming design and development teams is common in organizations. When using a team approach, it is important that individuals possessing the necessary skills and knowledge be included and available when they are needed. A major problem in corporate teams is a lack of sufficient access to key people. These key people need to be available at the right time in

order to produce high impact e-learning applications. Also, to make an effective design team, all participants of the team must stay with the project from beginning to end. This is especially important because many tasks in the e-learning development process are interdependent. Furthermore, the more sophisticated a design is, the more the program designers need to have a full understanding of the following elements:

- Content
- Characteristics of learners
- Behavioral outcomes that are necessary to achieve success
- Specific aspects of the performance environment that will challenge or aid performance
- Organization values, priorities, and policies.

In the DfEE report, 40 e-learning development skills were identified. These skills included Management, Communication, Planning, Analytical Skills, Creative Writing, Lesson Design, Computing, and Media Production Techniques (Whitlock, 1999). The respondents in this study ranked the top ten skills for each of six roles in the design team (Lewis and Whitlock, 2003). The three highest rated roles were the Project Leader, the Instructional Designer, and the Courseware Designer. The top ten skills for each of these e-learning roles are described in Table 1. The highest rated skill for any role was Project Management, which scored 98% for the Project Leader role.

Table 1

Priority Skills for E-learning Developers

Rank	Project Leader	Instructional Designer	Courseware Designer
1	Project management	Instructional design	Interactive screen design
2	Client management	Understanding how People learn	English Language skills
3	Planning	Training techniques	Storyboarding
4	Costing and budgeting	Writing aims and Objectives	Assessment techniques
5	English Language skills	English Language skills	Questioning techniques
6	Performance analysis	Task analysis	Understanding how people learn
7	Training needs analysis (TNA)	Training needs analysis (TNA)	Simulation design and development
8	Understanding how people learn	Subject matter research skills	Instructional design
9	Word processing	Questioning techniques	Media selection
10	Evaluation techniques	Assessment techniques	Scriptwriting for audio and video

(Lewis and Whitlock, 2003, p. 152)

Lewis and Whitlock (2003) state that the 40 development skills identified in the DfEE study can be reduced to twelve key skills required for e-learning development. These twelve skills are: project management, subject matter analysis, modular sequencing, writing objectives and tests, interface design, writing clearly, graphic design, questioning technique, giving feedback, using authoring software, developmental testing, and assessment.

If an organization decides to conduct its e-learning in-house, it is then faced with the task of training members of the e-learning team (Lewis and Whitlock, 2003). The skills that the design team needs are sorted into four groups – pedagogical skills (designing interactive modules, defining outcomes, devising questions and problems, giving feedback); IT skills (coding using authoring software, using special purpose design tools); project management skills (work scheduling, budgeting, client management); and graphic design skills (using graphic design software, using special purpose graphics tools to incorporate audio-visual material). There may be an imbalance in the distribution of these skills among the team members, especially when the team is first set up. There tends to be more individuals trained in graphic design and IT as these subjects are popular courses in higher education. Sometimes these individuals are recruited from outside the company. Individuals who are assigned the roles of project leader and author/designer are less likely to have formal training in the required skills as they are often recruited internally. The DfEE survey also identified four e-learning skills that are in short supply. These include understanding how people learn, project management, training needs analysis, and evaluation. Instructional Design was also a skill that was in short supply. Most of the time, these skills need to be learned from scratch. According to Whitlock (1999), the study also identified Writing Aims and Objectives and English Language Skills as areas that needed improvement as well.

CHAPTER III:

METHODOLOGY

Introduction

This study examines the skills that training staff need to possess in order to author interactive multimedia programs, specifically computer-based training and web-based training programs. This chapter explains the research methodology used. It includes the research design, population, instrumentation, a brief description of the data collection procedures and data analysis, and the limitations of the methodology used.

Research Design

This study measures the skills of in-house training staff before they started authoring programs as well as their current authoring skills. It also identifies the roles that exist in design teams. It further investigates what type of training these individuals received in order to learn how to author multimedia programs. The twelve skill areas that are measured in the survey were identified by Lewis and Whitlock (2003) based on the 40 e-learning development skills examined in the 1999 DfEE study by Dr. Jan Seabrook of Arenicola Designs. Participants rated their level of expertise in each of the skill areas. The subjects also answered questions on other topics related to the study, including the following:

- Organization size
- Length of time developing CBTs/WBTs
- Size of web/computer-based training design team
- Design team roles
- Development skills that participants feel they are lacking in

- How participants were trained to design CBTs/WBTs
- Overall comfort level with designing and developing CBTs/WBTs
- Recommendations for training to acquire needed skills
- Traditional classroom trainer experience (if applicable).

Population

The population for this study included individuals who currently author or who have authored web/computer-based training courses as part of an in-house design team in an organization. The sample included 57 individuals in the public and private sector that were identified by the researcher as in-house training staff who have experience developing web/computer-based training programs. A list of individuals was obtained from various state agencies and private companies in the states of Minnesota and Wisconsin, including an Authorware user group, an e-learning special interest group affiliated with a local chapter of the American Society for Training and Development (ASTD), and a university training department. The sample included individuals of various educational levels with varying amounts of experience authoring interactive multimedia programs.

Instrumentation

The researcher sent out a 12-question online survey (Appendix C) to potential participants. The survey was developed by the researcher for the purposes of this study based on research done on the key skills needed by authors of web/computer-based training programs. The survey was voluntary. The first part of the survey included questions on demographic information such as size of the organization and design team, length of time developing CBTs/WBTs, and design team roles. The next part of the

survey included questions on the twelve key skills that were identified in the research by Whitlock and Lewis. Participants used a Likert scale to rate their own expertise levels based on the twelve key skills identified. The scale measurement ranged from 1 to 5 – (1 - None, 2 - Low, 3 - Average, 4 - High, 5 - Very High). The remaining questions were check boxes for the participant to select an answer(s) among a number of choices including skills the author feels he/she is lacking in, how the participants were trained, their comfort level with authoring programs, and experience as a traditional classroom trainer. There was one open-ended question. The researcher submitted the survey to the University of Wisconsin–Stout Webmaster's office to have it converted to an online format.

Data Collection Procedures

The 12-question survey (Appendix C) was administered online. The University Webmaster's office provided the researcher with the address of the survey on the web. The researcher then distributed the Consent Form (Appendix A), Survey Letter (Appendix B), and web address of the online survey to the participants via e-mail. The e-mail containing the survey information was sent on May 4, 2004. The participants were given 2 1/2 weeks to complete the survey. The two-and-a-half-week period ended on May 21, 2004. A reminder notice was sent via e-mail on May 15, 2004 (see Appendix D). Thirty-one surveys were completed, with a return rate of 54%. Immediately after an individual submitted the survey online, the anonymous responses for that particular survey were sent to the researcher's e-mail address. The researcher collected the responses and entered the data into an Excel spreadsheet. The researcher was also able to view the results online at another address provided by the Webmaster's office. The

survey responses revealed the participants' levels of expertise on each of the twelve key skills identified, as well as other information pertinent to the study.

Data Analysis

Raw data were collected, entered on an Excel spreadsheet, and analyzed by comparing each participant's response to each survey. The responses for each question were totaled, and the percentage of participants choosing each response for questions 1 through 4, 7 through 9, 11 and 12 were calculated. The mean for each skill area for questions 5 and 6 was calculated using a formula in Microsoft Excel.

Limitations

One of the limitations of this study was the issue of confidentiality of participant e-mail addresses. In some instances, employers provided the e-mail addresses of their employees after approval from upper management. In other instances, survey information was provided to a contact person who then forwarded it individuals on his or her distribution list. This contact person then told the researcher how many participants he or she sent the survey to. With the latter method, the researcher had no control over when the survey information, including reminder e-mails, was sent to the participants. Thus, some of the participants may have received the survey information later than the May 4, 2004 distribution date. Furthermore, the researcher had no way of knowing if the participants that the contact person sent the e-mail to were appropriate for the study; that is, if they were in fact on a web/computer-based training design team. Thus, the response rate may appear lower than it actually is, as some individuals may not have answered the survey because the information in it did not pertain to them.

CHAPTER IV:

RESULTS

Introduction

The purpose of this study is to determine if organizational in-house training staff possess the necessary skills to author web-based training and computer-based training programs. A survey was given to determine the participants' expertise level in twelve skill areas prior to authoring interactive multimedia programs and their current authoring skills. Other questions on the survey were pertinent to the study such as type of training, role on the design team, length of time authoring WBTs/CBTs, and comfort level with authoring multimedia programs. This chapter presents the results of the survey.

Data Analysis

The percentage for each response to questions 1through 4, 7 through 9, 11 and 12 was calculated. The mean was calculated for questions 5 and 6 using a formula in Microsoft Excel. The data addresses the four research objectives of the study. The total number of respondents to the survey was 31, which was 54% of the surveys that were e-mailed.

Table 2: Question 1 – Size of Organization

How large is the organization (or department/division) that you author web/computer-based training for?	# of respondents	%
0-20 employees	2	7
21-50 employees	1	3
51-100 employees	3	10
More than 100 employees	24	77
No Response	1	3
Total	31	100

Table 2 shows the size of the organization that the respondents author web/computer-based training for. Based on the results, 77% of the respondents author

web and computer-based training programs for an organization that is more than 100 employees. This question was asked in order to determine if individuals in larger organizations had larger design teams and fewer roles in authoring programs.

Table 3: Question 2 – Length of Time Authoring CBTs/WBTs

How long have you been developing web/computer-based training (CBTs/WBTs)?	# of respondents	%
Under 1 year	6	19
1-2 years	4	13
3-5 years	14	45
6-10 years	4	13
More than 10 years	3	10
Total	31	100

The purpose of Question 2 was to determine if individuals with more experience felt they had more authoring skills and a greater comfort level designing and developing programs than those with less experience (see Table 9 results). The results showed that the majority of the respondents have authored programs for 3-5 years. Only 10% of the respondents have been designing and developing CBTs/WBTs for more than 10 years.

Table 4: Question 3 – Size of Design/Development Team

Which of the following best describes the size of your current or past web/computer-based training design/development team?	# of respondents	%
1-2 members	4	13
3-5 members	13	42
6-9 members	10	32
10 or more members	4	13
Total	31	100

Table 4 indicates that most of the respondents are members of design teams that consist of 3-5 members or 6-9 members. 42% of the respondents work on teams of 3-5 members, and 32% of the respondents work on teams of 6-9 members. The responses to this question were interesting because overall, most of the respondents work for an

organization with more than 100 employees (see Table 2). Therefore, the size of the organization does not seem to be an indicator of the size of the design team; i.e., more employees does not mean there is a larger design team (more than 10 members).

Table 5: Question 4 – Design Team Roles

What role(s) do you undertake in your design team? (Check all that apply)	# of respondents	%
Project Manager	17	55
Instructional Designer/Curriculum Designer	26	89
Programmer/Author	17	55
Graphics Designer	14	45
Audio-visual Coordinator	9	29
Subject Matter Expert	13	42
Webmaster	4	13

Question 4 was included to determine if design team members typically take on multiple roles in the authoring process, and if so, what roles they undertake. Table 5 shows that 89% of the respondents take on the role of Instructional Designer/Curriculum Designer. After this, participants most often participate in the roles of Project Manager and Programmer/Author. Only 13% of the respondents participate in the role of Webmaster.

Figure 1 shows the percentage of participants who have multiple roles on their design teams versus the percentage that have only one role. Of the 31 participants, 26 (84%) indicated that they took on multiple roles (two or more roles) in the authoring process. Only five (16%) participants indicated they were responsible for one role on their design teams.

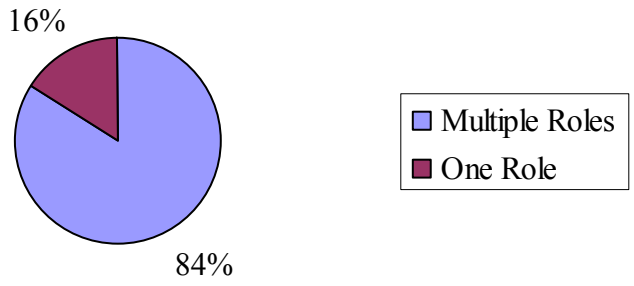

Figure 1. Number of roles participants undertake on design teams.

As shown in Table 4, 42% of the respondents work on a design team of only 3-5 members, which may explain why 84% of the respondents undertake multiple roles in the authoring process.

Table 6: Questions 5 and 6 – Previous and Current Expertise Level

On a rating scale from 1 to 5, what was your level of expertise in each of the following skills areas *before* your started authoring CBTs/WBTs?

On a rating scale from 1 to 5, what is your *current* level of expertise in each of the following skill areas as they related to authoring CBTs/WBTs?

Key Skills	Mean Expertise Level	
	Previous	Current
Project Management *(e.g., work scheduling, budgeting, client management)*	2.84	3.58
Subject Matter Analysis *(defining the performance problem, identifying the target group, investigating existing material, getting subject matter expertise*)	3.06	3.65
Modular Sequencing *(Grouping topics together that involve similar performances)*	2.94	3.81
Writing Objectives and Tests	3.1	3.68
Interface Design	1.84	3.13
Writing Clearly	3.97	4.16
Graphic Design *(using graphic design software, using special purpose graphic design tools to incorporate audio-visual material)*	1.87	2.77
Questioning Technique *(devising test questions and problems)*	2.65	3.35
Giving Feedback	3.13	3.58
Using Authoring Software *(e.g., coding, using special purpose design tools)*	1.42	3.03
Developmental Testing *(expert review, one-to-one trials, pilot, field testing)*	2.26	3.29
Assessment *(evaluate performance through evaluation meetings, data collection)*	2.58	3.23

Note: Response scale: 1=None 2=Low 3=Average 4=High 5=Very High

Table 6 indicates the average expertise level for each of the twelve skill areas identified in the survey. First, respondents rated each skill based on what they felt their expertise level was in each area before they began authoring CBTs/WBTs. The researcher asked this question in order to determine if participants felt they already had any of the skills prior to learning how to author CBT/WBT programs. Respondents then rated each skill based on their current expertise level in each area. This question was

designed to determine if the skill levels increased with time and experience authoring CBTs/WBTs. The table indicates the previous mean and the current mean for each of the twelve skill areas.

Participants rated their four strongest skill areas in the "Previous" column in Table 6 as Writing Clearly, Giving Feedback, Writing Objectives and Tests, and Subject Matter Analysis. The mean scores for each of these areas were: Writing Clearly – 3.97, Giving Feedback - 3.13, Writing Objectives and Tests - 3.1, and Subject Matter Analysis – 3.06. The participants rated their weakest skills in the "Previous" column as Graphic Design (mean of 1.87), Interface Design (mean of 1.84), and Using Authoring Software (mean of 1.42). Interestingly enough, these same three skill areas were rated as the weakest skills even after the participants had been authoring programs for a period of time, although the rating for each skill area clearly went up. Interface Design had a current mean of 3.13, Using Authoring Software had a mean of 3.03, and Graphic Design had a mean of 2.77. Finally, participants rated Writing Clearly, Writing Objectives and Tests, Subject Matter Analysis, and Modular Sequencing as their strongest skill areas after they had been designing and developing web/computer-based training programs for a period of time. These skill areas for current expertise level were almost the same as those indicated in the "Previous" column, although the rated expertise level for each skill was higher in the "Current" column. Writing Clearly had a mean of 4.16, Modular Sequencing had a mean of 3.81, Writing Objectives and Tests had a mean of 3.68, and Subject Matter Analysis had a mean of 3.65.

Table 7: Question 7 – Low Skill Areas

Which of the following web/computer-based training development skills do you feel you are lacking in? (Check all that apply)	# of respondents	%
Understanding how people learn	4	13
Project Management	7	23
Training Needs Analysis	10	32
Evaluation	10	32
Instructional Design	12	39
Other	7	23
No Response	3	10

The development skills for this question were chosen based on the results of the 1999 Arenicola study. The five skills listed in Table 7 were the skills that the Arenicola study found most of their respondents were lacking in. In the current study, the skill respondents felt they needed the most improvement in was Instructional Design. Thirty-nine percent of the respondents listed this as a skill they felt they were lacking in. Training Needs Analysis and Evaluation were also skills that 32% of the respondents felt they could improve. Twenty-three percent of the respondents listed other skill areas they felt they could improve on in the "Other" category. These skills included the following:

- "graphics and animation"
- "Pathlore interface" (a type of Learning Management System)
- "research"
- "Technical construction of a WBT/CBT"
- "Current Application Technology Skills"
- "technological aspects"
- "graphics."

Table 8: Question 8 – Training

How were you trained to design and development web/computer-based training? (Check all that apply)	# of respondents	%
Diploma/Degree Course (2 years)	1	3
Short Course for Certificate or Credit	6	19
Workshop/Seminar	18	58
Self-Study Package/Tutorial	14	45
On-the-Job	28	90
Other	4	13

Of the 31 participants, 77% indicated that they were trained by multiple methods (two or more of the methods listed in Table 8). Twenty-three percent of the respondents were trained by only one of the methods. Furthermore, most of the respondents (77%) listed that they had some sort of formal training – Diploma/Degree Course, Short Course for Certificate or Credit, and/or Workshop/Seminar. Formal training was completed either alone or combined with informal training. Twenty-three percent of the respondents indicated they did not receive formal training – they learned to author programs by Self-Study Package/Tutorial, and/or On-the-Job. Figure 2 shows the representation of formal and informal training methods.

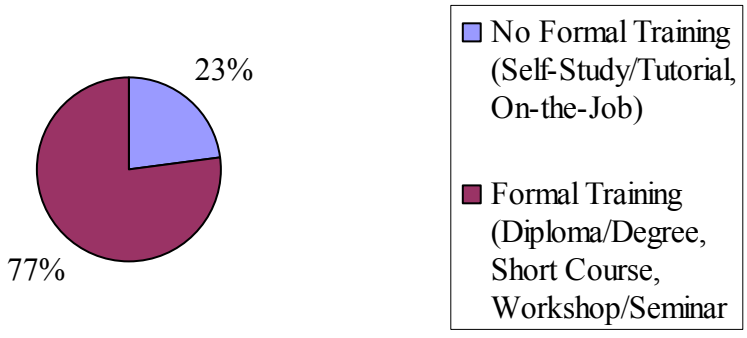

Figure 2. Training methods for CBT/WBT authors.

Ninety percent of the respondents indicated that they received on-the-job training; however, this was most likely combined with formal training as well. Fifty-eight percent of the respondents attended a workshop or seminar, and 45% learned through a self-study package/tutorial – again, this was probably combined with formal training. Thirteen percent of the participants stated that they were trained by a method other than those listed in Table 8. The "Other" responses included:

- "trainer brought in"
- "Covered in degree program"
- "Colleagues"
- "Graduate degrees PhD & MS."

Table 9: Question 9 – Comfort Level

What is your overall comfort level with designing and developing web/computer-based training?	# of respondents	%
Extremely Comfortable	6	19
Comfortable	9	29
Somewhat Comfortable	12	39
Not Very Comfortable	3	10
Not At All Comfortable	1	3
Total	31	100

Table 9 displays the overall comfort level of the participants for authoring CBTs/WBTs. Question 9 was asked in order to determine if the comfort level was higher for those that received more training and those who have been authoring programs longer. According to the survey responses, 39% of the participants are somewhat comfortable designing and developing web/computer-based training. Twenty-nine percent are comfortable authoring programs and 19% are extremely comfortable authoring WBTs/CBTs. This results in a total of 87% of the respondents who feel at least

somewhat comfortable authoring web/computer-based training programs. Of this 87%, 74% (20 out of 27 respondents) have been designing and developing web/computer-based training for three or more years. Figure 3 shows the representation of the years of authoring experience for respondents comfortable with authoring CBTs/WBTs.

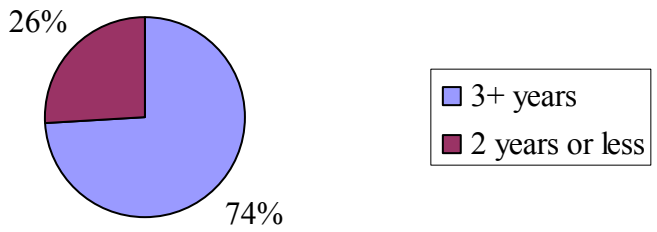

Figure 3. Years of experience for participants comfortable authoring CBTs/WBTs.

In addition, of the 87% that feel comfortable authoring programs, 89% (24 out of 27 respondents) received some sort of formal training either alone or in combination with other training methods. Only 3 of the 27 respondents (11%) who felt comfortable authoring programs did not receive formal training. Figure 4 shows the representation of training methods for respondents comfortable with authoring CBTs/WBTs.

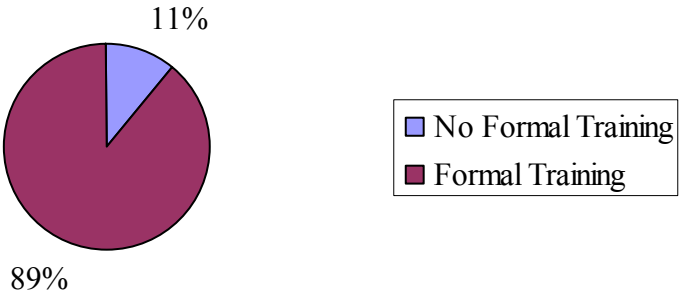

Figure 4. Training methods for participants comfortable authoring CBTs/WBTs.

Only 13% of the total respondents were uncomfortable or extremely uncomfortable authoring programs. Of these four individuals who were uncomfortable, three (75%) have been authoring web/computer-based training programs for two years or less. Figure 5 shows the representation of the years of authoring experience for respondents uncomfortable with authoring CBTs/WBTs.

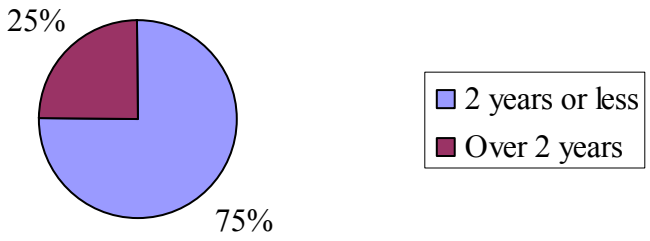

Figure 5. Years of experience for participants uncomfortable authoring CBTs/WBTs.

Furthermore, three of these four individuals (75%) learned to author programs on-the-job; only one of the four had formal training. Figure 6 shows the representation of training methods for respondents uncomfortable with authoring CBTs/WBTs.

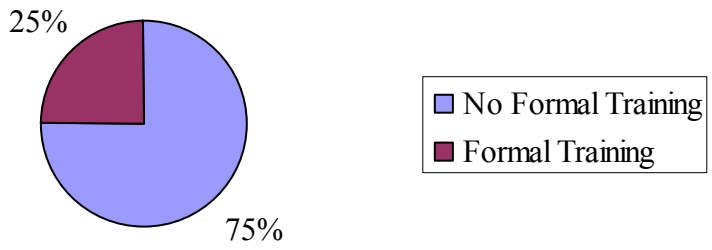

Figure 6. Training methods for participants uncomfortable authoring CBTs/WBTs.

Also important to note here is that just because a respondent rated that he/she was extremely comfortable with developing WBTs/CBTs doesn't mean that he/she is comfortable with the whole process of authoring. It may be possible that the person is only responsible for one or two roles on the design team, and it is those roles that he/she feels comfortable with.

Question 10: Training Recommendations

Question 10 of the survey asked the following: "What are your recommendations for training for someone who is going to be authoring web/computer-based training programs?" A summary of the responses is included in Appendix E.

Table 10: Question 11 – Experience as Classroom Trainer

Do you have experience as a trainer in a traditional classroom setting?	# of respondents	%
Yes	30	97
No	1	3
Total	31	100

Question 11 was included in the survey to ensure that those answering the survey had experience as a traditional classroom trainer. All but one respondent (97%) had experience as a classroom trainer. Since these individuals were really the target of the

study, the individual who did not have experience as a classroom trainer really should not have been included in the survey (see Limitations in Chapter III; Methodology).

Table 11: Question 12 – Length of Classroom Training Experience

If yes, how long?	# of respondents	%
Under 1 year	1	3
1-2 years	4	13
3-5 years	11	36
6-10 years	9	29
More than 10 years	5	16
No Response	1	3
Total	31	100

Question 12 was asked to determine the participants' length of time as a traditional classroom trainer. 81% of the respondents have more than three years of experience as a classroom trainer. Only 16% have been classroom trainers for two years or less. These percentages may be used to determine if individuals with less classroom experience feel less comfortable authoring CBTs/WBTs than those with more classroom experience. Of the 16% (5 individuals) with two years or less of classroom experience, all felt at least somewhat comfortable authoring CBTs. Of the 16% (5 individuals) who had more than 10 years of experience as classroom trainers, three individuals (60%) felt at least somewhat comfortable authoring programs. The other two individuals (40%) were either uncomfortable or extremely uncomfortable authoring programs. This seems to indicate that more time as a classroom trainer does not necessarily better prepare an individual to be effective at authoring web/computer-based training programs.

CHAPTER V:

DISCUSSION

Introduction

Because of the increased emphasis on incorporating technology into the training field, specifically on authoring interactive multimedia programs, the skills trainers need today are changing and expanding. This study examined the skills trainers need to design and develop effective web/computer-based training programs. The main purpose was to determine if organizational in-house training staff possess the necessary skills to develop effective multimedia programs. The results of the study are intended to aid employers in adequately preparing their employees to be part of a web/computer-based training design team.

Procedures and Instrumentation

This study involved 57 participants from various public and private organizations who currently author or have authored web/computer-based training programs. An online survey consisted of twelve key skill areas. The participants rated their level of expertise in each of the skill areas, as well as listed any authoring skills they felt they were lacking in. The skill areas identified in the study were obtained from current research by Lewis and Whitlock (2003) based on the 40 e-learning development skills examined in the 1999 DfEE study. The survey response rate was 31 responses out of a population of 57. This represents a 54% return rate. The researcher collected the anonymous responses and used a Microsoft Excel spreadsheet to analyze the data.

Limitations

There were two major limitations of this study:

1. It was difficult to get a large population, as many organizations that develop web/computer-based training only have 1 to 5 people on their design teams. Even though individuals from 11 companies/groups/organizations were contacted, the total population was still only 57. A major challenge was finding organizations that actually design and develop their multimedia programs in-house versus outsourcing.
2. This study only examined twelve skill areas. Lewis and Whitlock (2003) based these twelve key skills on the DfEE study, which examined 40 learning development skills. Because this study did not go beyond the twelve skill areas, it is not known if other key skills should have been included.

Findings

The findings of this research were as follows:

- The typical size of a design team is 3 to 5 people, even in larger organizations (those with more than 100 employees).
- Many design team members take on multiple roles, even in larger organizations (over 100). Most team members undertake several different roles.
- The expertise level and comfort level increased with more formal training. Those who stated that they only had on-the-job training or took a tutorial in authoring skills seemed to struggle more with design and development than those who had more formal, ongoing training. This was true of individuals who were authoring programs for several years.

- Those who had been authoring programs more than three years reported higher comfort levels with designing and developing CBTs/WBTs than those with less than three years of authoring experience.

Conclusions

There were four research objectives in this study. The first objective was to determine if training staff have the key skills needed to develop interactive multimedia programs. Based on the data collected, most individuals felt that their expertise level increased in the twelve areas with experience and formal training. In a few individual cases, some of the skills areas actually decreased after they learned to author programs. There may be a couple explanations for this. The author's role(s) on the design team may have changed, and since the author no longer used a particular skill as much, it may have led to a decreased expertise level. Furthermore, individuals who received formal training or education in a particular area, such as graphic design, may have once had a high skill level in that area. However, if this person did not participate in graphic design in the authoring process, again, his or her skills level in that area may have decreased.

According to the survey results, participants rated Graphic Design, Authoring Software, and Interface Design as their weakest skills both before learning how to author CBTs/WBTs and after learning how to author programs. This finding supports the research that states that it takes a lot of time and ongoing formal training to learn how to author interactive multimedia programs. Allen (2003) states that designing and developing good e-learning is a complex process. Likewise, Rosenberg (2001) stated that it takes time for people to feel comfortable with the process of authoring, and they need to attend training sessions as well as get the experience of developing a program.

Furthermore, the skill areas of Interface Design, Graphic Design, and Authoring Software are not typical skills that traditional classroom trainers possess, thus formal training in these areas is important for those who design and develop e-learning.

The four strongest skills listed by respondents before learning how to author CBTs/WBTS were: Writing Clearly, Giving Feedback, Writing Objectives and Tests, and Subject Matter Analysis. These were almost the same as the respondents' current strong skills, which were: Writing Clearly, Modular Sequencing, Writing Objectives and Tests, and Subject Matter Analysis. These skills are typically those needed by traditional classroom trainers who write their own training materials, and this finding supports research by Goad (1997) that trainers need strong communication skills, which includes writing. This study showed that these skills became stronger with more experience authoring multimedia programs. Lewis and Whitlock (2003) sorted design team skills into four groups: pedagogical skills, IT skills, project management skills, and graphic design skills. The scores on the current expertise level of the participants seem to indicate that on the average, respondents have stronger pedagogical and project management skills and weaker IT and graphic design skills.

The second objective was to identify the authoring skills staff members feel they are lacking in. These skills were listed in the survey as identified in the Arenicola study. Participants were also able to write in other skills besides the ones listed. The skills that participants said they were lacking in most were Instructional Design, Training Needs Analysis, and Evaluation. All three of these skill areas are integral parts of several Instructional Design models, thus indicating the importance of knowing these skills. It also reiterates the importance of the authoring process not just being about learning an

authoring tool, but including project management, instructional design, analysis, development, and production (Whitlock, 1999). Thus, employers may want to keep in mind that all parts of the authoring process need to be covered when training CBT/WBT authors.

The additional skills participants listed in the "Other" category for skills they felt they were lacking in included research, integrating the program with a Learning Management System (LMS), graphics and animation, and technical skills for developing a WBT/CBT. Again, these skills seem to be mostly technical and graphics skills. All of the responses to this question support the research by Allen (2003) that states that there are many skills needed to author effective multimedia programs, and it is very rare to find someone who possesses all these skills. Even individuals with many years of design and development experience seem to have at least one area they feel they are lacking in. This supports the idea that design teams that include several individuals with varying skills are essential to the authoring process. Furthermore, it also supports the claim by Allen (2003) that design and development of effective multimedia programs is extremely complex, especially since many different media and technologies need to be integrated into the process.

The third objective was to identify the role(s) of the design team members. Most of the respondents (84%) listed multiple roles that they undertake on the design team. This again supports the research that states that one person can take on many roles in the authoring process, especially in smaller companies. According to the data collected in this study, this also seemed to be true of larger organizations as well, since most of the

respondents (77%) author multimedia programs for organizations with over 100 employees.

Finally, the last objective of this study was to describe the type of training needed to author effective training programs. Again, those with more formal training and years of experience seemed to have a higher comfort level with authoring programs than those who did not have formal training (89% of those who felt comfortable authoring programs had some type of formal training, either alone or in combination with informal training). Almost all the comments on the survey for training recommendations included classroom or customized training, education, hands-on experience, adequate time to learn the necessary skills, and ongoing practice or use of the programs. This is a strong indication that employers need to be sure that their design team members are getting the training and experience they need in order to author effective programs. Simply taking a tutorial or learning by "playing" and too little time to practice the necessary skills will not enable authors to produce effective work. This mirrors research by Koller, Frankenfield, and Sarly (2000), which found that when developers attempted to learn development tools by "playing" and not attending any formal training, the learning process was extremely slow and painful.

Recommendations

Based on the findings of this study, there are areas that still need more research. One of these is the skills needed to author programs. The Arenicola study looked at 40 e-learning development skills, which Lewis and Whitlock reduced to twelve key skill areas. The Arenicola study was only one study conducted in the UK that ranked the 40 skills

according to design roles. A duplicate study could be conducted in the United States to determine if it results in similar findings.

Second, more research could be done to determine the specific skills needed to author programs with instructional interactivity, a term coined by Michael Allen (2003). Allen states that there is a difference in having interaction in a program and having good interaction in a program.

Next, this study was aimed at individuals with experience as a traditional classroom trainer. A study could be done to determine if traditional classroom trainers who become web/computer-based training authors have an "edge" over those who have not been classroom trainers. In other words, do these individuals already bring a skill set to the design team (such as writing skills and knowing what motivates people to learn)? Does length of time as a classroom trainer affect the skill set as well? Even more specific than this, further research could focus on certain skills of classroom trainers such as writing clearly, writing objectives and tests and subject matter analysis. Does traditional classroom training experience better prepare an individual in certain skill areas to author CBTs/WBTs?

Since all but one of the respondents in this study did have experience as a traditional classroom trainer, a study could be conducted to determine how other work assignments affect the learning curve of a web/computer-based training author. For example, if a member of a design team also writes curriculum and trains classroom sessions, how do these other job duties affect the length of time to adequately learn authoring skills? Finally, future researchers could also use the results of this study to

develop guidelines for the amount of formal training that is needed in order to author effective multimedia programs.

Based on the results of this study, it is further recommended that employers take a close look at the clearly complex process of authoring multimedia programs. It is important for them to realize all the skill areas necessary to develop an effective web/computer-based training program, not just an electronic page-turner. With this in mind, employers also need to realize the amount of time and formal training it will take individuals to learn to design and develop e-learning. It is not a short, easy learning process. Emphasis needs to be put on learning the more technical aspects of developing CBTs/WBTs. Furthermore, employers need to be patient while an individual is learning to design and develop programs, and they also need to understand that it takes time to author a good program. Not only is formal training important, but time to practice authoring skills and continuous learning in different formats is essential.

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APPENDIX A:

CONSENT FORM

I understand that by returning/completing this questionnaire, I am giving my informed consent as a participating volunteer in this study. I understand the basic nature of the study and agree that any potential risks are exceedingly small. I also understand the potential benefits that might be realized from the successful completion of this study. I am aware that the information is being sought in a specific manner so that no identifiers are necessary and so that confidentiality is guaranteed. I realize that I have the right to refuse to participate and that my right to withdraw from participation at any time during the study will be respected with no coercion or prejudice.

NOTE: *Questions or concerns about the research study should be addressed to Carol Stirn, phone 952-226-6131, e-mail cstirn@aol.com, or Dr. David Johnson, Professor, Department of Vocational and Technical Education, 143 Communication Technologies Building, phone 715-232-2143, e-mail, johnsondav@uwstout.edu.*

Questions about the rights of research subjects can be addressed to Sue Foxwell, Human Protections Administrator, UW-Stout Institutional Review Board for the Protection of Human Subjects in Research, 11 Harvey Hall, Menomonie, WI, 54751, phone 715-232-1126.

APPENDIX B:

SURVEY LETTER

Carol Stirn
13516 Quebec Avenue
Savage, MN 55378
Phone: (952)226-6131
Email: cstirn@aol.com

May 4, 2004

Dear Sir or Madam:

Due to the increasing emphasis on the use of technology in training, more organizations are choosing to utilize computer-based training (CBT) and web-based training (WBT) programs to enhance the learning of their customers. Many organizations are choosing to use existing training staff to author their web/computer-based training programs instead of outsourcing, or contracting outside of their organizations.

I am graduate student in the Training and Development program at the University of Wisconsin–Stout. I am conducting a study to determine if in-house training staff who are part of CBT/WBT design teams possess the necessary skills to design and develop web/computer-based training courses. Current research shows that there are twelve key skills necessary for the development of CBTs/WBTs.

Your input is essential in order to assess the current skill levels of individuals who are part of web/computer-based training design teams. This information may be important in determining if organizations are adequately preparing their in-house training staff to author CBTs/WBTs. The information gathered here may also be important for helping employers to determine what type of training employees need to learn how to author effective CBTs/WBTs and how long the learning process may take.

Please complete the survey on-line at http://www.uwstout.edu/survey/webtrainingskills.php by **Friday, May 21, 2004**. Your anonymity is ensured in this study. The University of Wisconsin-Stout Webmaster's Office will send the anonymous survey responses to me. A Consent Form is also included in this e-mail.

Thank you in advance for your time and input.

Sincerely,

Carol Stirn

APPENDIX C:

SURVEY

Web/Computer-Based Training Authoring Skills for In-House Training Staff

1. How large is the organization (or department/division) that you author web/computer-based training for?

   □ 0-20 employees
   □ 21-50 employees
   □ 51-100 employees
   □ more than 100 employees

2. How long have you been developing web/computer-based training (CBTs/WBTs)?

   □ Under 1 year
   □ 1-2 years
   □ 3-5 years
   □ 6-10 years
   □ More than 10 years

3. Which of the following best describes the size of your current or past web/computer-based training design/development team?

   □ 1-2 members
   □ 3-5 members
   □ 6-9 members
   □ 10 or more members

4. What role(s) do you undertake in your design team? (Check all that apply)

   □ Project Manager
   □ Instructional Designer/Curriculum Designer
   □ Programmer/Author
   □ Graphics Designer
   □ Audio-visual Coordinator
   □ Subject Matter Expert
   □ Webmaster

5. On a rating scale from 1 to 5, what was your level of expertise in each of the following skill areas *before* you started authoring CBTs/WBTs?

   (1) None (2) Low (3) Average (4) High (5) Very High

Key Skills	**1**	**2**	**3**	**4**	**5**
Project Management *(e.g., work scheduling, budgeting, client management)*					
Subject Matter Analysis *(defining the performance problem, identifying the target group, investigating existing material, getting subject matter expertise*)					
Modular Sequencing *(Grouping topics together that involve similar performances)*					
Writing Objectives and Tests					
Interface Design					
Writing Clearly					
Graphic Design *(using graphic design software, using special purpose graphic design tools to incorporate audio-visual material)*					
Questioning Technique *(devising test questions and problems)*					
Giving Feedback					
Using Authoring Software *(e.g., coding, using special purpose design tools)*					
Developmental Testing *(expert review, one-to-one trials, pilot, field testing)*					
Assessment *(evaluate performance through evaluation meetings, data collection)*					

6. On a rating scale from 1 to 5, what is your *current* level of expertise in each of the following skill areas as they relate to authoring CBTs/WBTs?

   (1) None (2) Low (3) Average (4) High (5) Very High

Key Skills	**1**	**2**	**3**	**4**	**5**
Project Management *(e.g., work scheduling, budgeting, client management)*					
Subject Matter Analysis *(defining the performance problem, identifying the target group, investigating existing material, getting subject matter expertise*)					
Modular Sequencing *(Grouping topics together that involve similar performances)*					
Writing Objectives and Tests					

Interface Design					
Writing Clearly					
Graphic Design *(using graphic design software, using special purpose graphic design tools to incorporate audio-visual material)*					
Questioning Technique *(devising test questions and problems)*					
Giving Feedback					
Using Authoring Software *(e.g., coding, using special purpose design tools)*					
Developmental Testing *(expert review, one-to-one trials, pilot, field testing)*					
Assessment *(evaluate performance through evaluation meetings, data collection)*					

7. Which of the following web/computer-based training development skills do you feel you are lacking in? (Check all that apply)

   □ Understanding how people learn
   □ Project Management
   □ Training Needs Analysis
   □ Evaluation
   □ Instructional Design
   □ Other (please list) _____

8. How were you trained to design and develop web/computer-based training? (Check all that apply)

   □ Diploma/Degree Course (2 years)
   □ Short Course for Certificate or Credit
   □ Workshop/Seminar
   □ Self-Study Package/Tutorial
   □ On-the-Job
   □ Other

9. What is your overall comfort level with designing and developing web/computer-based training?

   □ Extremely Comfortable
   □ Comfortable
   □ Somewhat Comfortable
   □ Not Very Comfortable
   □ Not At All Comfortable

10. What are your recommendations for training for someone who is going to be authoring web/computer-based training programs?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

11. Do you have experience as a trainer in a traditional classroom setting?

□ Yes
□ No

If yes, how long?

□ Under 1 year
□ 1-2 years
□ 3-5 years
□ 6-10 years
□ More than 10 years

APPENDIX D:

SURVEY REMINDER

On May 4, 2004 I sent you a survey on the skill areas needed to effectively design and develop web/computer-based training programs. If you have already completed this survey, please disregard this reminder, and thanks again for your input. If you have not completed the survey, please do so online at http://www.uwstout.edu/survey/webtrainingskills.php by **May 21, 2004**. It only takes about 10 minutes to complete.

Although your participation is voluntary, please remember that your input is important in determining if organizations are adequately preparing their in-house training staff in the key skill areas needed to author CBTs/WBTs. Again, your anonymity is ensured in this study. If you have any questions or concerns please contact me at (952) 226-6131 or at cstirn@aol.com.

Thanks again for your time.

Carol Stirn

APPENDIX E:

SUMMARY OF TRAINING RECOMMENDATIONS

Formal Training

"Take the book tutorials then take a class."

"Obtain all outside training as possible."

"Make sure that person is trained in the authoring tool software from beginning to advanced. Also, allow for graphic design training. Lastly, courses on how to design interactive web/computer-based training."

"You cannot train a person to write good CBT programs in typical corporate training program. They need a proper educational background in training/education and perhaps technical training."

"Learning Macromedia Flash does not make one a programmer or CBT developer. Writing a few scripts for training programs or manuals using Word does not make one an Instructional Designer. IDs need formal instructional training, both general instructional education and training specific to computer-delivered instruction."

"Instructional Design background."

"To obtain training in authoring tools, gain understanding of how students learn with online training, understand how to structure the learning program and make it interactive."

"Instructional design and learning theory are more important that learning the authoring tools."

"Adequate training before being thrown into it."

"I would recommend that people have a solid foundation in curriculum design and knowledge of how people learn. Sometimes "glitzy" technology gets in the way of learning."

Hands-on Experience/On-the-Job Training

"Learn by hands-on work is ideal."

"Get customized training with a real life work project as part of the training."

"As much hands on as possible in order to retain what you are learning."

"Have a project to work on as training takes place or immediately afterwards. I find this is one area of 'use it or lose it'."

"Academic training along with on the job training.

"Experience of converting off-line training materials to online format to learn vast differences both in presentation, delivery, writing for online, etc."

"Take the extra steps needed to create a quality piece. Use Adult Learning theory as well as make the WBT/CBT professional looking. If it just looks like PowerPoint strung together, it won't be taken as seriously as you would hope for."

Continuous Learning

"Never quit learning, read, and take classes where needed."

"Make sure they use the programs they learn on a regular basis so they retain the information."

"Sufficient time – AW [Authorware] is time consuming and management most times fail to recognize the fact."

"Keep it as simple as possible. Allow it to be stopped and started as needed."

Knowledge of Subject Matter

"Know your subject matter, your customer, and you and your teams abilities."

"Know your subject matter."

"I think in the beginning being a subject matter expert is important, to help with the flow of designing the CBT/WBT. Later on, as you become comfortable with the software, you don't have to now the "subjects" as in depth."

"Don't focus on the technology or the tools. Focus on learning how to scope a project and carefully understanding the customer's requirements."

Use Available Resources

"Collaborate, communicate, and cooperate with other CBT authors – explore resources."

"If I were to request a methodology for myself, it would involve some one-on-one tutoring and teaming in addition to workshop. Self study in technology doesn't work for me at all."

"Work with a mentor."

Mentoring very soon after the academic training is critical."

"Working in teams of people that can bring different skill sets to the project seems to be much more effective than one person trying to do everything and do it well. There are many roles in WBT/CBT development, and it's very difficult for one person to master them all."